U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Cyanea kuhihewa*

COMMON NAME: Haha

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: July 2005

STATUS/ACTION:

___ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

___ New candidate

_X__ Continuing candidate

___ Non-petitioned

_X__ Petitioned - Date petition received: May 11, 2004

__ 90-day positive - FR date:

_X_ 12-month warranted but precluded - FR date: May 11, 2005

_N_ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions. During the past 12 months, most of our national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (http://endangered.fws.gov).

___ Listing priority change

Former LP: ___

New LP: ___

Latest Date species became a Candidate: 1997

___ Candidate removal: Former LP: __

___ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.
___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
___ F – Range is no longer a U.S. territory.
___ I – Insufficient information exists on biological vulnerability and threats to support listing.
___ M – Taxon mistakenly included in past notice of review.
___ N – Taxon does not meet the Act's definition of "species."
___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Flowering plants, Campanulaceae (Bellflower family)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, island of Kauai

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, island of Kauai

LAND OWNERSHIP: The only known wild population occurred on private land.

LEAD REGION CONTACT: Paul Phifer, 503-872-2823, paul_phifer@fws.gov

LEAD FIELD OFFICE CONTACT: Pacific Islands Fish and Wildlife Office, Christa Russell, 808-792-9400, christa_russell@fws.gov

BIOLOGICAL INFORMATION:
Species Description *Cyanea kuhihewa* is a shrub 0.4 to 2.3 meters (m) (1.2 to 7.4 feet (ft)) tall; with unbranched erect stems 0.4 to 0.5 centimeters (cm) (0.16 to 0.2 inches (in)) in diameter. Leaves are glabrous, 31 to 38 cm (12 to 15 in) long, 1.2 to 1.5 cm (0.5 to 0.6 in) wide, and slightly paler below. Inflorescences are ascending, 5 to 8-flowered, with a peduncle 10 to 16 millimeters (mm) (0.4 to 0.6 in) long and sparsely pubescent. Calyx lobes are triangular, 1.4 to 1.5 mm (0.06 in) long, and 0.9 to 1.1 mm (0.04 in) wide. The corolla is rose-purple with lobes edged in white, 47 to 53 mm (1.9 to 2.1 in) long, a curved tube 28 to 33 mm (1.9 to 2.1 in) long and 5.3 mm (0.2 in) at the base. Mature berries have not been observed. Seeds are ellipsoid, dark brown or black, 0.7 to 0.8 mm (0.03 in) long, and 0.3 to 0.4 mm (0.03 in) wide, smooth and shiny (Lammers 1996; Lammers 1999).

Taxonomy *Cyanea kuhihewa* was first described by Lammers (1996) based on a collection made by Wood *et al*. in 1991. This species is recognized as a distinct taxon in the supplement to the *Manual of the Flowering Plants of Hawaii* (Wagner and Herbst 2003), the most recently accepted Hawaiian plant taxonomy.

Habitat *Cyanea kuhihewa* is found in *Metrosideros polymorpha-Dicranopteris linearis* lowland wet forest with associated species such as *Antidesma platyphyllum*, *Athyrium microphyllum*, *Bidens* sp., *Bobea* sp., *Boehmeria grandis*, *Cibotium* sp., *Diplopterygium pinnatum*, *Eurya sandwicensis*, *Freycinetia arborea*, *Hedyotis acuminata*, *Isodendrion longifolium*, *Machaerina* sp., *Melicope feddei*, *Pisonia* sp., *Perrottetia sandwicensis*, *Psychotria* sp., *Sadleria* sp., *Tetraplasandra* sp., and *Wikstroemia* sp., at an elevation of 512 m (1,680 ft) (Wood 1994; Lammers 1996; Ken Wood, National Tropical Botanical Garden, pers. comm. 1996; Hawaii Natural Heritage Program Database 2004).

Historical and Current Range/Current Status This species was only ever known from one population totaling six individuals in Limahuli Valley on Kauai (Lammers 1996; Ken Wood, National Tropical Botanical Garden, pers. comm. 1996). In 2003 the last known individual in the wild died, but prior to that time seeds were collected for genetic storage and the species is still found in cultivation (Steve Perlman, National Tropical Botanical Garden, pers. comm. 2004; Ken Wood, pers. comm. 2004).

THREATS:

A. The present or threatened destruction, modification, or curtailment of its habitat or range.
Pigs (*Sus scrofa*) are a threat to this species (Wood 1994; Ken Wood, pers. comm. 1996). As early as 1778, European explorers introduced livestock, which became feral, increased in number and range, and caused significant changes to the natural environment of Hawaii. Past and present activities of introduced alien mammals are the primary factor altering and degrading vegetation and habitats on Kauai. The pig is originally native to Europe, northern Africa, Asia Minor, and Asia. European pigs, introduced to Hawaii by Captain James Cook in 1778, became feral and invaded forested areas, especially wet and mesic forests and dry areas at high elevations. They are currently present on Kauai and four other islands, and inhabit rain forests and grasslands. While rooting in the ground in search of the invertebrates and plant material they eat, feral pigs disturb and destroy vegetative cover, trample plants and seedlings, and threaten forest regeneration by damaging seeds and seedlings. They disturb soil and cause erosion, especially on slopes. Alien plant seeds are dispersed on their hooves and coats as well as through their digestive tracts, and the disturbed soil is fertilized by their feces, helping these plants to establish. Pigs are a major vector in the spread of many introduced plant species (Smith 1985; Stone 1985; Medeiros *et al*. 1986; Scott *et al*. 1986; Tomich 1986; Cuddihy and Stone 1990; Wagner *et al*. 1999a). Although pigs have been fenced out of the location where the last known wild individual died, continued monitoring and maintenance of those fences will be necessary to ensure that pigs from surrounding areas do not access the area and threaten any reintroduction attempts of *Cyanea kuhihewa*.

B. Overutilization for commercial, recreational, scientific, or educational purposes.
None known.

C. Disease or predation.
Rats and slugs are a major threat to members of the bellflower family in Hawaii and therefore are

a potential threat to this species (L. Mehrhoff, pers. comm. 1994; S. Perlman, pers. comm. 1994; K. Wood, pers. comm. 1996). Rats and slugs will eat any portion of the plant, and have been documented completely removing all leaves from plants (Joel Lau, Hawaii Natural Heritage Program, pers. comm. 1994; Loyal Mehrhoff, U.S. Fish and Wildlife Service (Service), pers. comm. 1994). Of the four species of rodents that have been introduced to the Hawaiian Islands, the species with the greatest impact on the native flora and fauna is probably *Rattus rattus* (black or roof rat), which now occurs on all the main Hawaiian Islands. Black rats, and to a lesser extent *Mus musculus* (house mouse), *R. exulans* (Polynesian rat), and *R. norvegicus* (Norway rat), eat the fruits of some native plants, especially those with large, fleshy fruits. Many native Hawaiian plants produce fruit over an extended period of time, thus producing a prolonged food supply for rodent populations. Black rats strip bark from some native plants, and eat the fleshy stems and fruits of plants in the bellflower and African violet families (Tomich 1986; Cuddihy and Stone 1990; J. Lau, pers. comm. 1994). Rat damage to the stems of species of *Cyanea* has been reported in the wet forests of Kauai. On the island of Hawaii, a species in a closely related genus was completely defoliated by rats (Jack Jeffrey, Service, pers. comm. 1995).

Little is known about the predation of certain rare Hawaiian plants by slugs. The effect of slugs on the decline of this and related species is unclear, although slugs may pose a threat by feeding on the stems and fruit, thereby, reducing the vigor of the plants and limiting regeneration (L. Mehrhoff, pers. comm. 1994; S. Perlman, pers. comm. 1994). Outplanted seedlings of the closely related genus *Clermontia* have been completed removed by slugs (Alvin Yoshinaga, University of Hawaii's Lyon Arboretm, pers. comm. 1995).

Currently, there are no on-going conservation measures for these threats in the last known location occupied by *Cyanea kuhihewa*.

D. The inadequacy of existing regulatory mechanisms.
Pigs are managed in Hawaii as game animals but may populate inaccessible areas where hunting is difficult, if not impossible, and therefore has little effect on their numbers (Hawaii Heritage Program 1990). Pig hunting is allowed on all islands either year-round or during certain months, depending on the area (Hawaii Department of Land and Natural Resources n.d.-a, n.d.-b, n.d.-c, n.d.-d). However, public hunting does not adequately control the number of pigs to eliminate this threat to *Cyanea kuhihewa*. Although pigs have been fenced out of the location where the last known wild individual died, continued monitoring and maintenance of those fences will be necessary to ensure that pigs from surrounding areas do not access the area and threaten any reintroduction attempts of *Cyanea kuhihewa*.

E. Other natural or manmade factors affecting its continued existence.
Numerous weed species threaten *Cyanea kuhihewa*, including *Clidemia hirta* (discussed below) (K. Wood, pers. comm. 1996).

The original native flora of Hawaii consisted of about 1,400 species, nearly 90 percent of which were endemic. Of the total native and naturalized Hawaiian flora of 1,817 taxa, 47 percent were introduced from other parts of the world, and nearly 100 species have become pests (Smith 1985;

Wagner *et al*. 1999a). Several studies (Cuddihy and Stone 1990; Wood and Perlman 1997; Robichaux *et al*. 1998) indicate nonnative plant species may outcompete native plants similar to *Cyanea kuhihewa*. Competition may be for space, light, water, or nutrients, or there may be a chemical inhibition of other plants (Smith 1985; Cuddihy and Stone 1990). In addition, nonnative pest plants found in habitat similar to that of this species have been shown to make the habitat less suitable for native species (Smathers and Gardner 1978; Smith 1985; Loope and Medeiros 1992; Medeiros *et al.* 1992; Ellshoff *et al.* 1995; Meyer and Florence 1996; Medeiros *et al.* 1997; Loope *et al*. 2004). In particular, alien pest plant species modify habitat by modifying availability of light, altering soil-water regimes, modifying nutrient cycling, or altering fire characteristics of native plant communities (Smith 1985; Cuddihy and Stone 1990; Vitousek *et al*. 1987). Because of demonstrated habitat modification and resource competition by nonnative plant species in habitat similar to habitat of *Cyanea kuhihewa*, the Service believes nonnative plant species are a threat to *Cyanea kuhihewa*. The remaining unmanaged populations of *Cyanea kuhihewa* are still impacted by this threat.

One weed that is a serious threat to *Cyanea kuhihewa* is *Clidemia hirta* (Koster's curse) (K. Wood, pers. comm. 1996). Koster's curse, a noxious shrub native to tropical America, is found in mesic to wet forests on at least six islands in Hawaii (Almeda 1999; Hawaii Department of Agriculture 1981; Smith 1985). This noxious pest forms a dense understory, shading out other plants and hindering plant regeneration, and is considered the major alien plant threat (Cuddihy and Stone 1990).

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

This species was originally included in the proposed rulemaking for the Kauai II plant species submitted to the Regional Office, but was removed from the proposed rule published in 60 FR 49359 on October 2, 1995, because the species had not yet been described and published at that time.

The Service is working with the landowner through the private lands program to control weeds and ungulates in the area where the only known population of *Cyanea kuhihewa* occurred, and for future reintroduction efforts with material the National Tropical Botanical Garden has in genetic storage (National Tropical Botanical Garden 2005).

SUMMARY OF THREATS:

Currently, this species is represented only in an *ex situ* collection. In the wild, the major threats to this taxon are pigs and nonnative plant species, which are believed to be a major cause of the extirpation of this species from the wild. Slugs and rats are potential threats. Feral pigs have been fenced out and nonnative plants have been reduced in the only historically known wild location of *Cyanea kuhihewa*. Future conservation efforts for this species include reintroduction into the only known location.

LISTING PRIORITY:

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	**Imminent**	Monotypic genus	1
		Species	**2***
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude:

Currently, *Cyanea kuhihewa* is represented only in an *ex situ* collection. This species is highly threatened by pigs that degrade and destroy habitat, by rats and slugs that that may directly prey upon it, and by non-native plants that outcompete and displace it. Threats to the lowland wet forest habitat of *Cyanea kuhihewa* occur throughout its range, and are expected to continue or increase without their control or eradication. Feral pigs have been fenced out and nonnative plants have been reduced in the only historically known location of *Cyanea kuhihewa*, but that did not prevent its extirpation. Future conservation efforts for this species include reintroduction into the only known location.

Imminence:

Threats to *Cyanea kuhihewa* from pigs and non-native plants are considered imminent because they are ongoing.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No. *Cyanea kuhihewa* was only ever known from one population totaling six individuals in Limahuli Valley on Kauai. In 2003 the last known individual in the wild died, but prior to that time seeds were collected for genetic storage, and the species is in cultivation at the National Tropical Botanical Garden. The Service is working with the landowner through the private lands program to control weeds and ungulates in the area where the only historically known population occurred, and for future reintroduction efforts. If it becomes apparent that the routine listing process is not sufficient to prevent further losses that may result in this species' extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of *Cyanea kuhihewa* as new information

becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures

DESCRIPTION OF MONITORING:
The information in this form is based on the results of two meetings of 20 botanical experts held by the Center for Plant Conservation in December 1995 and November 1996, and was updated by personal communication with Jack Jeffrey, Service, in 1995; Ken Wood, National Tropical Botanical Garden, in 1996; Steve Perlman, National Tropical Botanical Garden, in 1994, Joel Lau, Hawaii Natural Heritage Program, in 1994; Loyal Mehrhoff, Service, in 1994; and Alvin Yoshinaga, Lyon Arboretum, in 1995. We have incorporated additional information on this species from our files and the most recent supplement to the *Manual of the Flowering Plants of Hawaii* (Wagner and Herbst 2003). In 2004 the Pacific Islands office contacted the following species experts: Bob Hobdy, retired from Hawaii Division of Forestry and Wildlife; Joel Lau, Hawaii Natural Heritage Program; Art Medeiros, U.S.G.S. Biological Resources Discipline; Hank Oppenheimer, resource manager for Maui Land and Pineapple Company; and Steve Perlman and Ken Wood, National Tropical Botanical Garden. New information was provided by Steve Perlman and Ken Wood in 2004. In 2005 we contacted the species experts listed below, but no new information on status or surveys was provided.

The Hawaii Natural Heritage Program identified this species as critically imperiled (Hawaii Natural Heritage Program Database 2004). The International Union for Conservation of Nature and Natural Resources Red Plant Data Book rarity category was not included for this species in Wagner *et al.* (1999b), since it was not a published name at the time the "Hawaiian Vascular Plants at Risk" manuscript was completed.

Species experts were contacted but did not provide new information this year, no new literature was found, and no known entities are studying this species. This species was only ever known from one population in Limahuli Valley on Kauai.

COORDINATION WITH STATES:
In October 2004 we provided the Hawaii Division of Forestry and Wildlife with copies of our most recent candidate assessments for their review and comment. Vickie Caraway, the State botanist, reviewed the information for this species and provided no additional information or corrections (V. Caraway, pers. comm. 2005).

LITERATURE CITED:
List all experts contacted:

Name	Date	Place of Employment
1. Joel Lau	June 28, 2005	Hawaii Natural Heritage Program
2. Art Medeiros	June 28, 2005	U.S.G.S. Biological Resources Discipline
3. Jim Jacobi	June 28, 2005	U.S.G.S. Biological Resources Discipline
4. Rick Warshauer	June 28, 2005	U.S.G.S. Biological Resources Discipline
5. Hank Oppenheimer	June 28, 2005	Maui Land and Pineapple Company
6. Kapua Kawelo	June 28, 2005	U.S. Army
7. Dave Lorence	June 28, 2005	National Tropical Botanical Garden

8. Steve Perlman	June 28, 2005	National Tropical Botanical Garden
9. Ken Wood	June 28, 2005	National Tropical Botanical Garden
10. Marie Bruegmann	July 13, 2005	U.S. Fish and Wildlife Service
11. Vickie Caraway	June 14, 2005	Hawaii Division of Forestry and Wildlife

List all databases searched:

Name	Date
1. Hawaii Natural Heritage Program	2004

Other resources utilized:

Almeda, F. 1999 Melastomataceae: *In* Wagner, W.L., D.R. Herbst, and S.H. Sohmer, Manual of the Flowering Plants of Hawai`i. University of Hawaii Press and Bishop Museum Press, Honolulu. Bishop Mus. Spec. Publ. 97: 903-917.

Center for Biological Diversity, Dr. Jane Goodall, Dr. E.O. Wilson, Dr. Paul Ehrlich, Dr. John Terborgh, Dr. Niles Eldridge, Dr. Thomas Eisner, Dr. Robert Hass, Barbara Kingsolver, Charles Bowden, Martin Sheen, the Xerces Society, and the Biodiversity Conservation Alliance. 2004. Hawaiian Plants: petitions to list as federally endangered species. May 4, 2004.

Cuddihy, L.W., and C.P. Stone. 1990. Alteration of native Hawaiian vegetation; effects of humans, their activities and introductions. Coop. Natl. Park Resources Stud. Unit, Hawaii. 138 pp.

Hawaii Department of Agriculture. 1981. Title 4, Subtitle 6, Chapter 68, Noxious weed rules. State of Hawaii, Honolulu. Administrative rules, 12 pp.

Hawaii, Department of Land and Natural Resources. N.d.-a. Summary of Title 13, Chapter 123, Game mammal hunting rules, island of Oahu. Division of Forestry and Wildlife, Honolulu. 2 pp.

Hawaii, Department of Land and Natural Resources. N.d.-b. Summary of Title 13, Chapter 123, Game mammal hunting rules, island of Molokai. Division of Forestry and Wildlife, Honolulu. 2 pp.

Hawaii, Department of Land and Natural Resources. N.d.-c. Summary of Title 13, Chapter 123, Game mammal hunting rules, island of Maui. Division of Forestry and Wildlife, Honolulu. 2 pp.

Hawaii, Department of Land and Natural Resources. N.d.-d. Summary of Title 13, Chapter 123, Game mammal hunting rules, island of Kauai. Division of Forestry and Wildlife, Honolulu.

Lammers, T.G. 1996. A new linear-leaved Cyanea (Campanulaceae: Lobelioideae) from Kaua`i, and the "rediscovery" of Cyanea linearifolia. Brittonia 48(2):237-240.

Lammers, T.G. 1999. Campanulaceae: *In* Wagner, W.L., D.R. Herbst, and S.H. Sohmer, Manual of the Flowering Plants of Hawai'i. University of Hawaii Press and Bishop Museum Press, Honolulu. Bishop Mus. Spec. Publ. 97: 420-489.

Medeiros, A.C., Jr., L.L. Loope, and R.A. Holt. 1986. Status of native flowering plant species on the south slope of Haleakala, East Maui, Hawaii. Coop. Natl. Park Resources Stud. Unit, Hawaii, Techn. Rept. 59:1-230.

National Tropical Botanical Garden. 2005. 2004-2005 Annual report for the feral ungulate perimeter fence for Limahuli Upper Valley. Prepared for the U.S. Fish and Wildlife

Service, July 31, 2005.
Robichaux, R., J. Canfield, F. R. Warshauer, L. Perry, M. Bruegmann, and G. Carr. 1998. Adaptive Radiation. Endangered Species Bulletin. November/December.
Scott, J.M., S. Mountainspring, F.L. Ramsey, and C.B. Kepler. 1986. Forest bird communities of the Hawaiian Islands: Their dynamics, ecology, and conservation. Studies in Avian Biology 9: 1-429. Cooper Ornithological Society, Los Angeles.
Smith, C.W. 1985. Impact of alien plants on Hawai`i's native biota: *In* Stone, C.P., and J.M. Scott (eds.), Hawai`i's Terrestrial Ecosystems: Preservation and Management. Coop. Natl. Park Resources Stud. Unit, Univ. Hawaii, Honolulu, pp. 180-250.
Tomich, P.Q. 1986. Mammals in Hawai`i: A synopsis and notational bibliography. Bishop Museum Press, Honolulu. 375 pp.
Vitousek, P.M., C.M. D'Antonio, L.L. Loope, M. Rejnanek, and R. Westerbrooks. 1997. Introduced species: a significant component of human-caused global change. New Zealand Journal of Ecology 21(1): 1-16.
Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999a. Manual of the Flowering Plants of Hawai`i. Bishop Mus. Spec. Publ. 97: 1-1918. University of Hawaii Press and Bishop Museum Press, Honolulu.
Wagner, W.L., M.M. Bruegmann, and J.Q.C. Lau. 1999b. Hawaiian vascular plants at risk: 1999. Bishop Mus. Occas. Pap. 60: 1-58.
Wagner, W.L. and D.R. Herbst. 2003. Electronic supplement to the manual of flowering plants of Hawai‘i, version 3.1. December 12, 2003. Available from the Internet. URL: http://rathbun.si.edu/botany/pacificislandbiodiversity/hawaiianflora/supplement.htm.
Wenkam, R. 1969. Kauai and the Park Country of Hawaii. Sierra Club, San Francisco. 160 pp.
Wood, K. 1994. National Tropical Botanical Garden—Provenance Report, *Cyanea kuhihewa* in ed.
Wood, K.R. and S. Perlman. 1997. Maui 14 plant survey final report. Submitted by National Tropical Botanical Garden, October, 1997.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes to the candidate list, including listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all 12-month petition findings, additions of species to the candidate list, removal of candidate species, and listing priority changes.

Approve: Acting _____ 11/16/05
Regional Director, Fish and Wildlife Service Date

_____

Concur: _____ August 23, 2006
Director, Fish and Wildlife Service Date

Do not concur: _____ _____
Director, Fish and Wildlife Service Date

Date of annual review: September 16, 2005
Conducted by: Marie M. Bruegmann, Pacific Islands FWO
Plant Recovery Coordinator

Comments:
PIFWO Review

Reviewed by: Christa Russell_____ Date: September 18, 2005
Plant Conservation Program Leader

Gina Shultz_____ Date: October 13, 2005__
Assistant Field Supervisor,
Endangered Species

Patrick Leonard_____ Date: October 13, 2005
Field Supervisor